CLAIMS

What is claimed is:

1. A gas processing plant comprising:

a refluxed absorber operating at a first pressure, producing a bottoms product stream and receiving a feedstock and an absorber reflux stream;

a distillation column fluidly coupled to the absorber, receiving a distillation column feed stream and operating at a second pressure that is at least 100psi lower than the first pressure; and

wherein at least a portion of the bottoms product stream is expanded and provides cooling for at least one of the absorber reflux stream and the distillation column feed stream.

2. The gas processing plant of claim 1 wherein the distillation column comprises a de-ethanizer column.

3. The gas processing plant of claim 2 wherein the feedstock is at a pressure of between 1000psig and 2000psig.

4. The gas processing plant of claim 3 wherein at least a portion of the feedstock is expanded in a turboexpander.

5. The gas processing plant of claim 3 wherein the bottoms product stream has a pressure and wherein expanding the bottoms product stream reduces the bottoms product stream pressure in a range of 100-250psi.

6. The gas processing plant of claim 3 wherein the expanded bottoms product stream has a temperature between -95°F to -125°F.

7. The gas processing plant of claim 3 wherein the expanded absorber bottoms product stream is fed as the distillation column feed stream into the distillation column at a position that is at least three trays below an upmost tray of the distillation column.

8. The gas processing plant of claim 3 wherein the expanded bottoms product stream further provides cooling for a distillation column overhead stream.

9. The gas processing plant of claim 3 wherein the distillation column produces a distillation column overhead stream that is compressed, cooled, and fed into the absorber as the absorber reflux stream.

10. The gas processing plant of claim 3 wherein the feedstock comprises propane, and wherein the distillation column produces a distillation column product stream that comprises at least 95% of the propane in the feedstock.

11. The gas processing plant of claim 2 wherein the feedstock is at a pressure of between 550psig and 800psig.

12. The gas processing plant of claim 11 wherein the feedstock is fed into the absorber without passing through a turboexpander.

13. The gas processing plant of claim 11 wherein the bottoms product stream has a pressure and wherein expanding the bottoms product stream reduces the bottoms product stream pressure in a range of 100-250psi.

14. The gas processing plant of claim 11 wherein the bottoms product stream has a temperature between -50°F to -70°F.

15. The gas processing plant of claim 11 wherein the expanded bottoms product stream is fed as the distillation column feed stream into the distillation column at a position that is at least three trays below an upmost tray in the distillation column.

16. The gas processing plant of claim 11 wherein at least a portion of the feedstock is fed into a lower section of the distillation column.

17. The gas processing plant of claim 11 further comprising an external refrigeration coupled to the distillation column.

18. The gas processing plant of claim 1 wherein the distillation column comprises a demethanizer.

19. The method of claim 18 wherein the feedstock is at a pressure of between 1000psig and 2000psig.

20. The gas processing plant of claim 18 wherein at least a portion of the feedstock is expanded in a turboexpander.

21. The gas processing plant of claim 18 wherein the bottoms product stream has a pressure and wherein expanding the bottoms product stream reduces the bottoms product stream pressure in a range of 100-250psi.

22. The gas processing plant of claim 18 wherein the expanded bottoms product stream has a temperature between -95°F to -125°F.

23. The gas processing plant of claim 18 wherein the expanded bottoms product stream is fed as the distillation column feed stream into the distillation column.

24. The gas processing plant of claim 18 wherein the distillation column produces a methane rich distillation column overhead stream that is compressed, cooled, and fed into the absorber as the absorber reflux stream.

25. The gas processing plant of claim 18 wherein the distillation column produces a distillation column product stream that comprises no more than 500ppm carbon dioxide.

26. The gas processing plant of claim 18 wherein the feedstock is split into a first portion and a second portion, and wherein an external refrigeration cools at least part of the first portion.

27. The gas processing plant of claim 26 further comprising at least one side reboiler coupled to the distillation column, wherein the at least one side reboiler is fluidly coupled to the demethanizer between a top tray and a position eight trays below the top tray, provides heat duty for stripping CO_2 from a demethanizer product stream, provides reboiling of the distillation column, and further provides cooling of the first portion of the feedstock.

28. The gas processing plant of claim 1, wherein the absorber and the distillation column are configured into a single tower configuration.